

3-D Laser Scanning

Surveyor's Definition:

Advanced surveying instrument

Combines high-speed laser and digital imagery

Captures and stores vast amounts of coordinate information and digital images.

3-D Laser Scanner Assembly & Individual Elements:



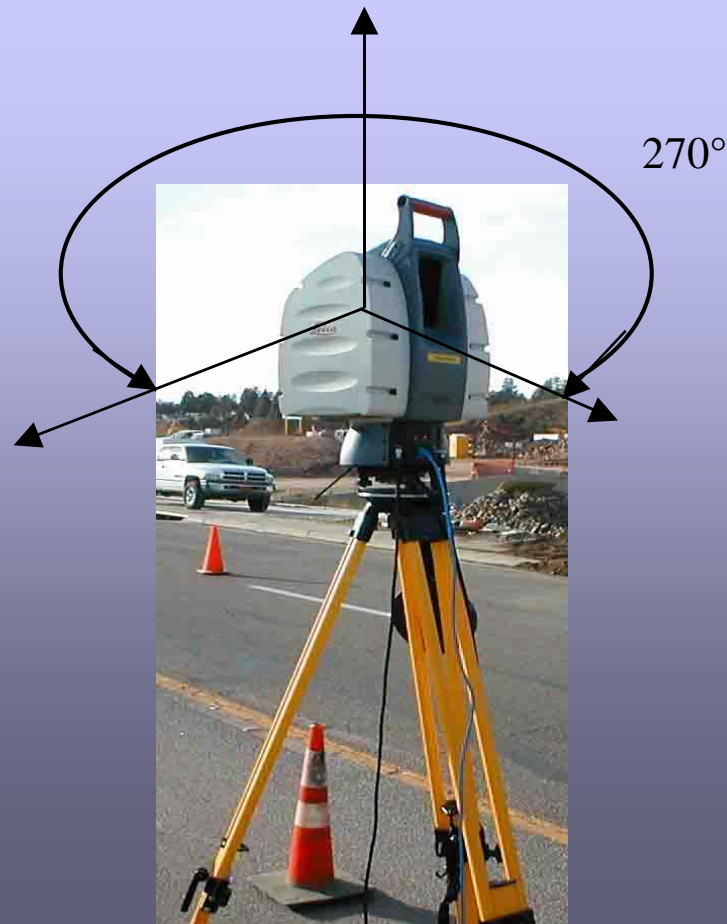
3-D Laser Scanner Specifications

360° Horizontal Field of View



3-D Laser Scanner Specifications

360° Horizontal Field of View **270° Vertical Field of View**

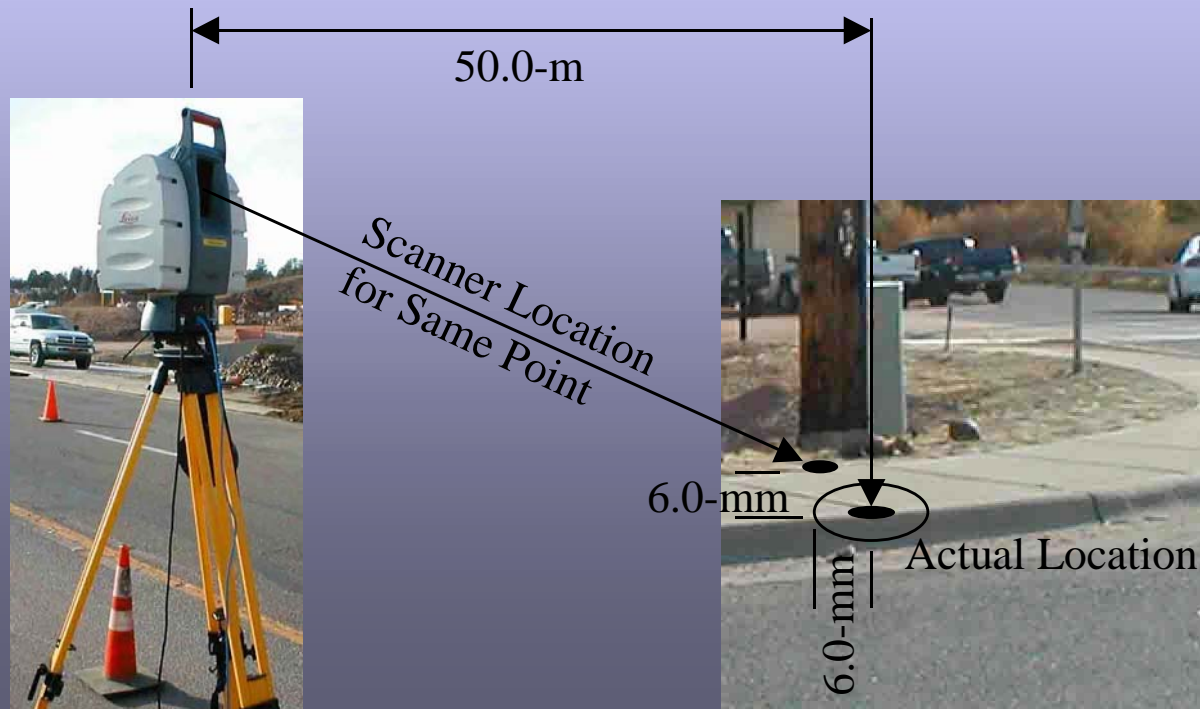


3-D Laser Scanner Specifications

360° Horizontal Field of View

270° Vertical Field of View

6.0-mm (or 0.02-ft) Positional Accuracy at 50.0-m (or 164.0-ft)



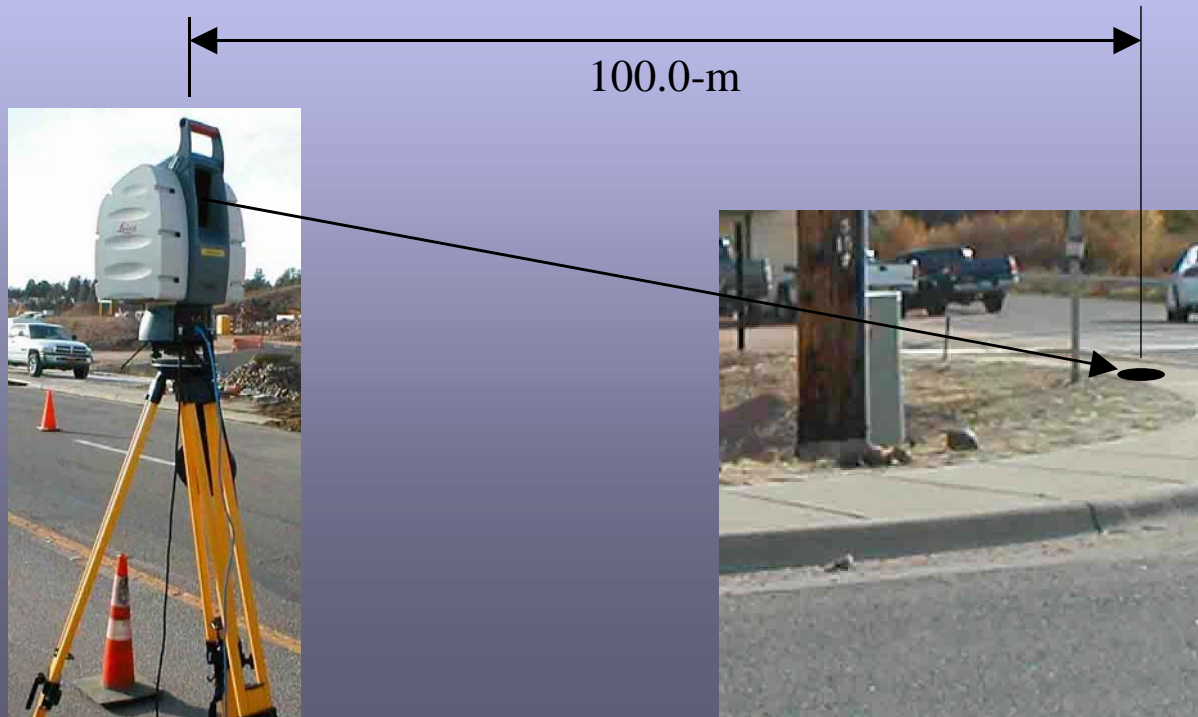
3-D Laser Scanner Specifications

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1.0-m (or 3.28-ft) to 100.0-m (or 328-ft) Effective Range



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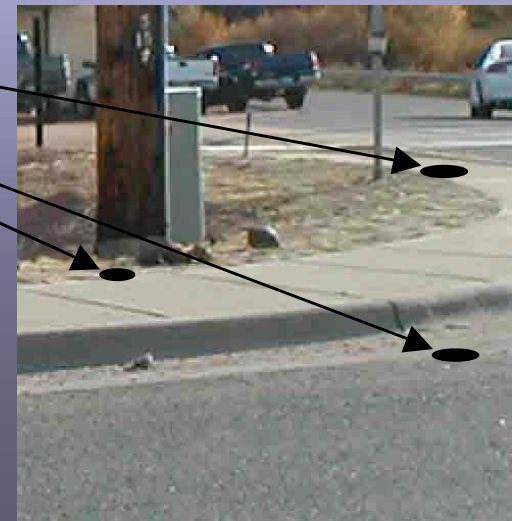
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Laptop Specifications:

3.4 GHz Pentium 4

1GB RAM

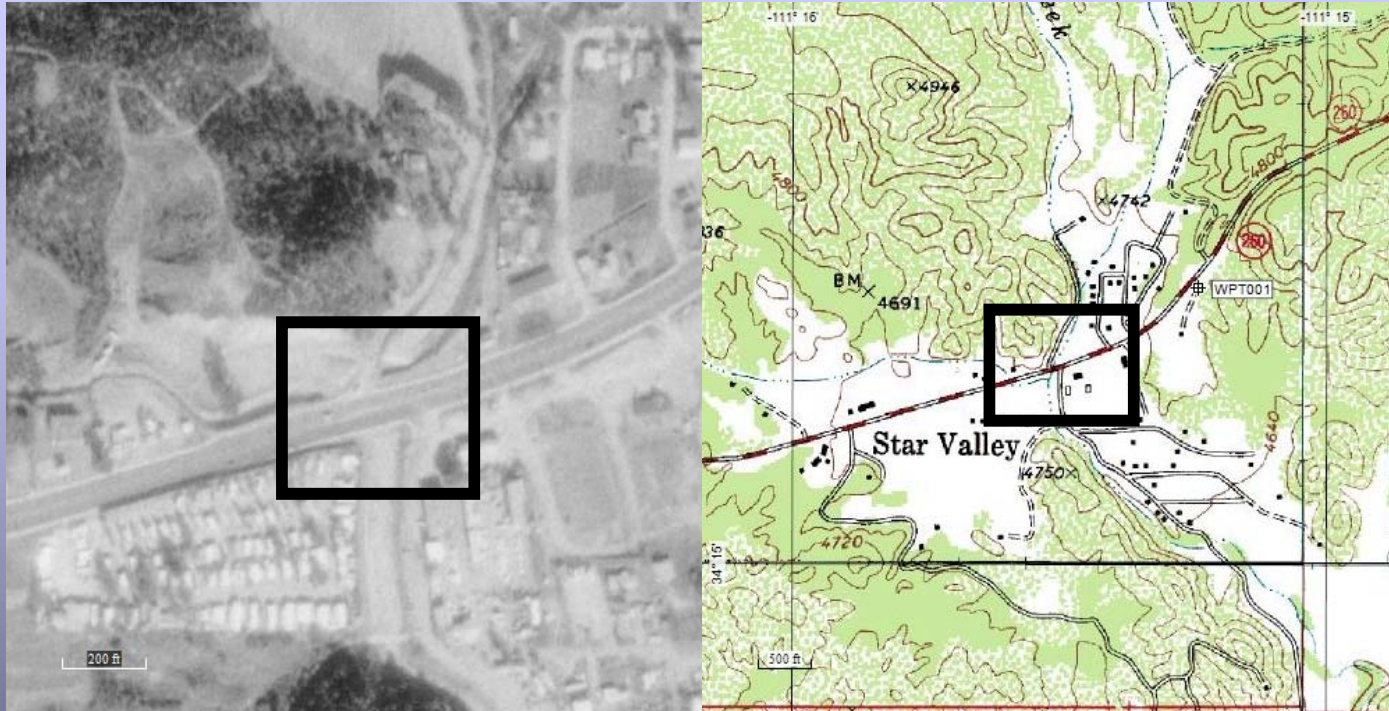
Ethernet

SXGA



Example Project, SR 260

Example Project - LS 1051, 260 GI 252 H6593 S1D



OBJECTIVE:

Locate a Pavement DIP.

PROJECT CONSTRAINTS:

High Traffic/Safety, Flat Area , & Local Construction

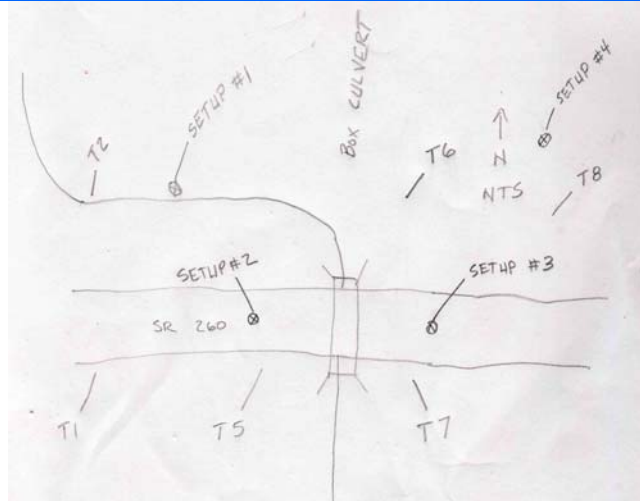
Planning, Control, Setup & Scanning

How does it work?



Planning, Control, Setup & Scanning

PLANNING



CONTROL WORK

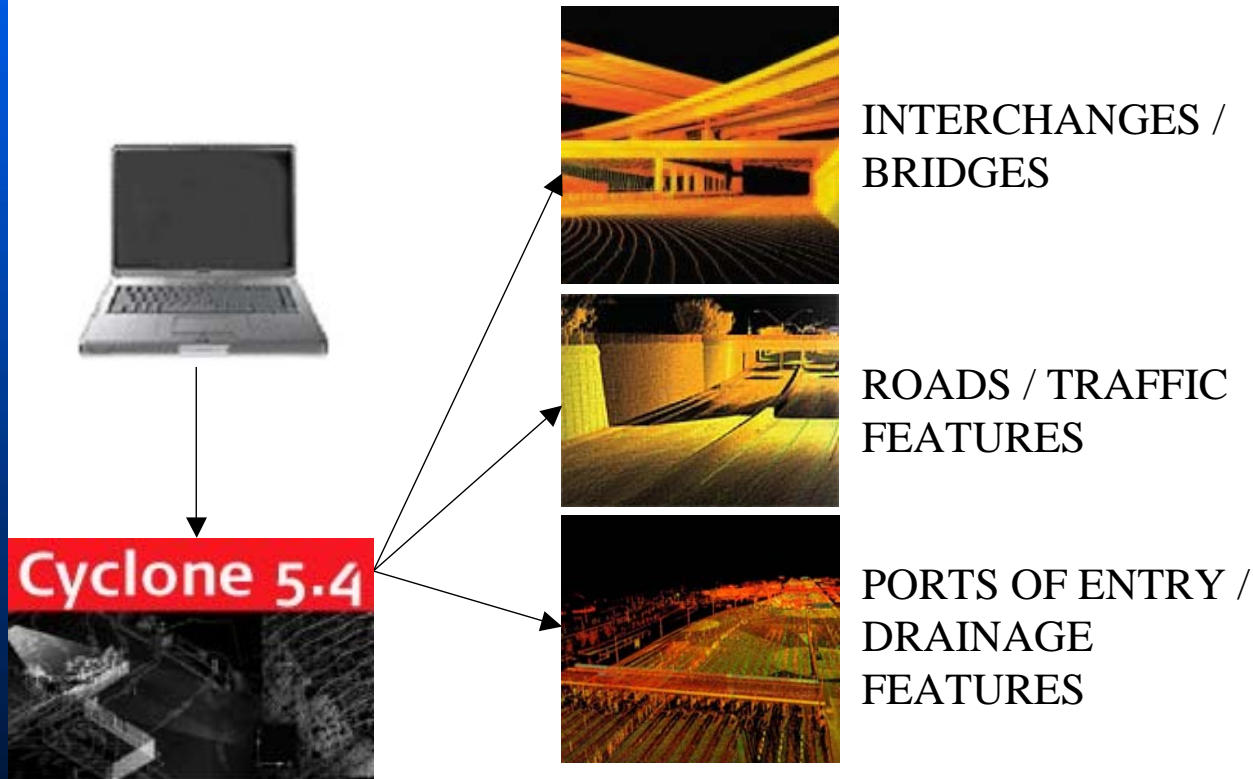


SCANNING



Visualization: Photos & Point Clouds

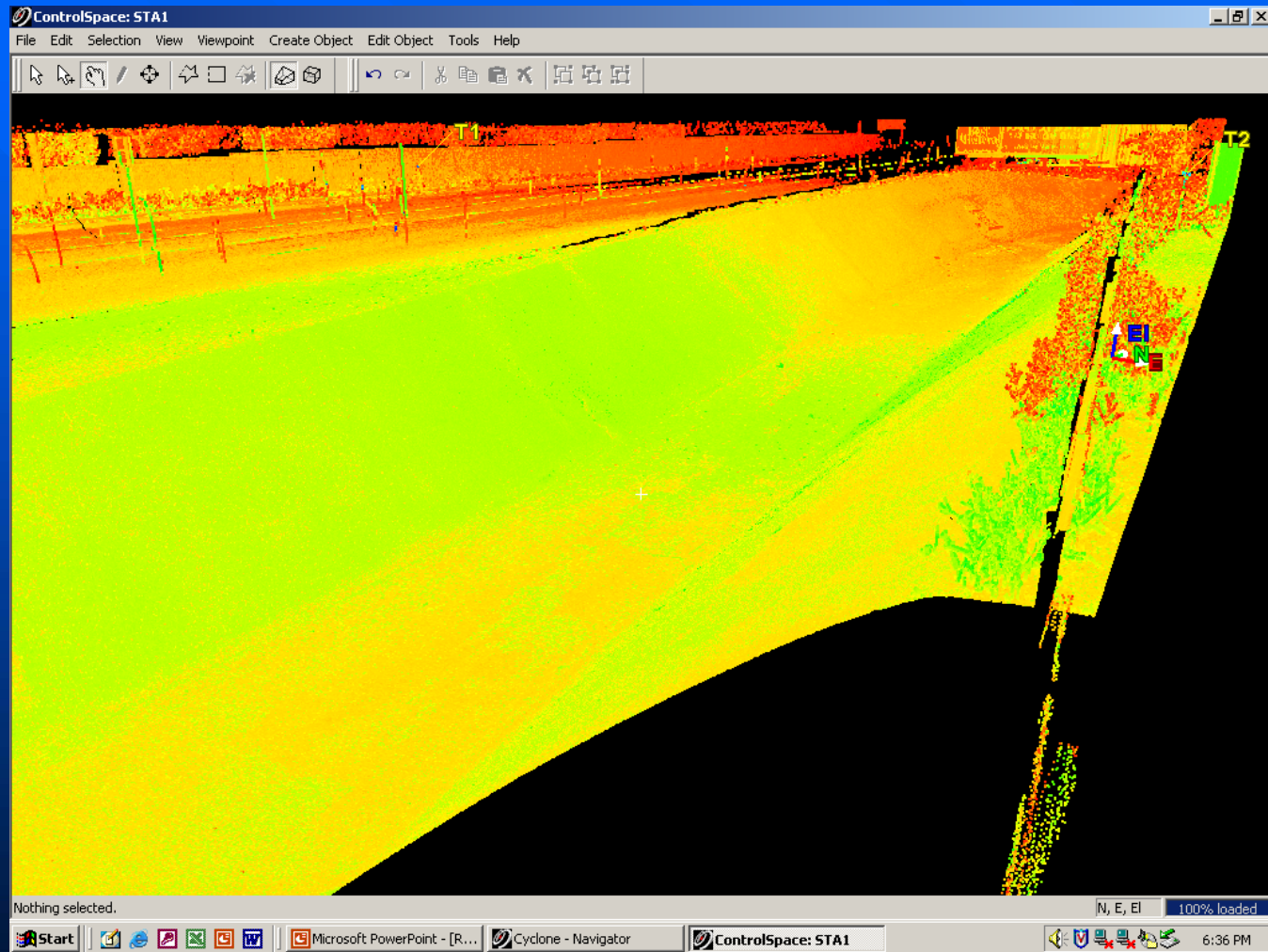
How does it work?



Digital Photo Taken By Scanner



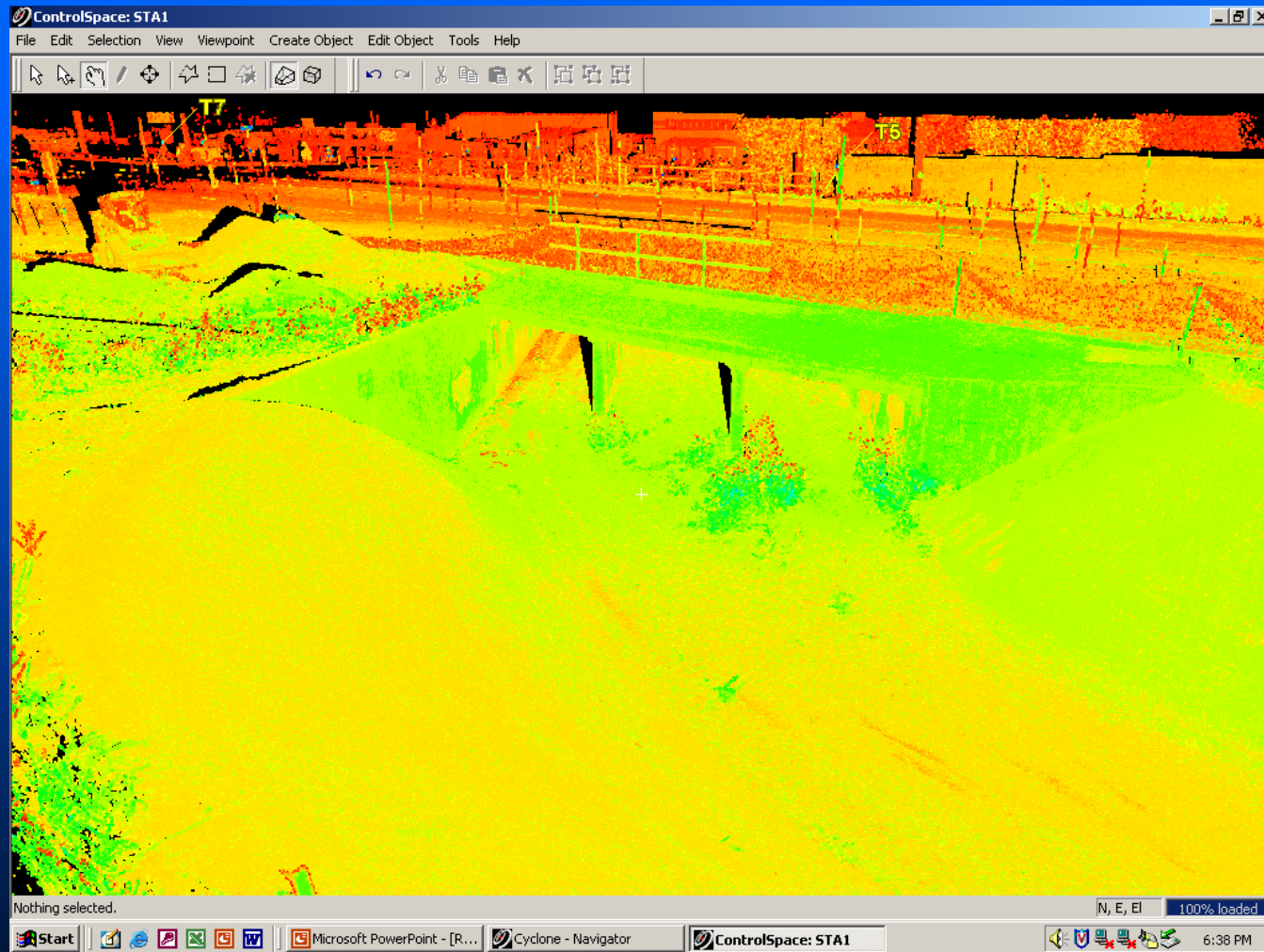
Point Clouds: Facing Southwest



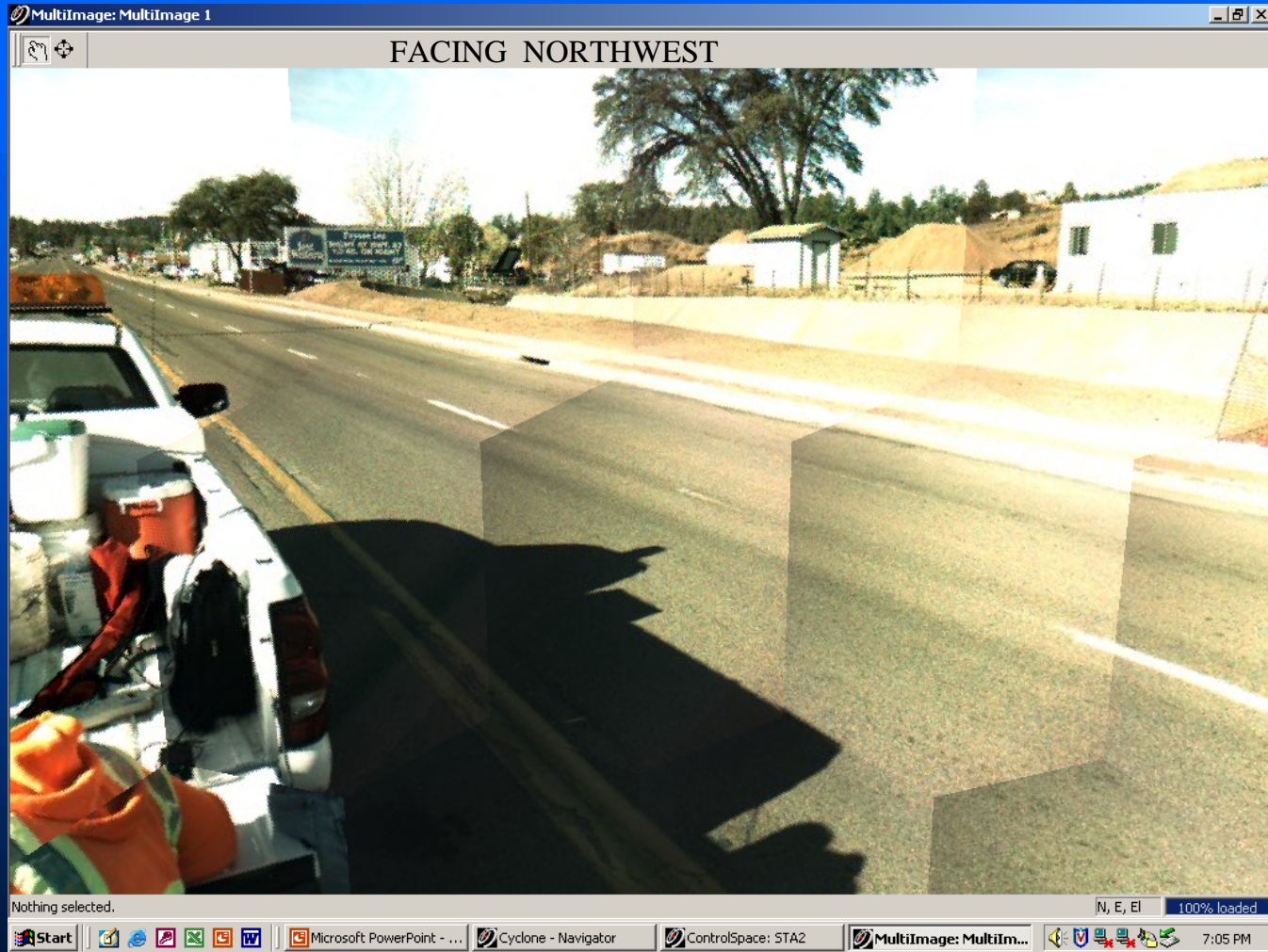
Digital Photo Taken By Scanner



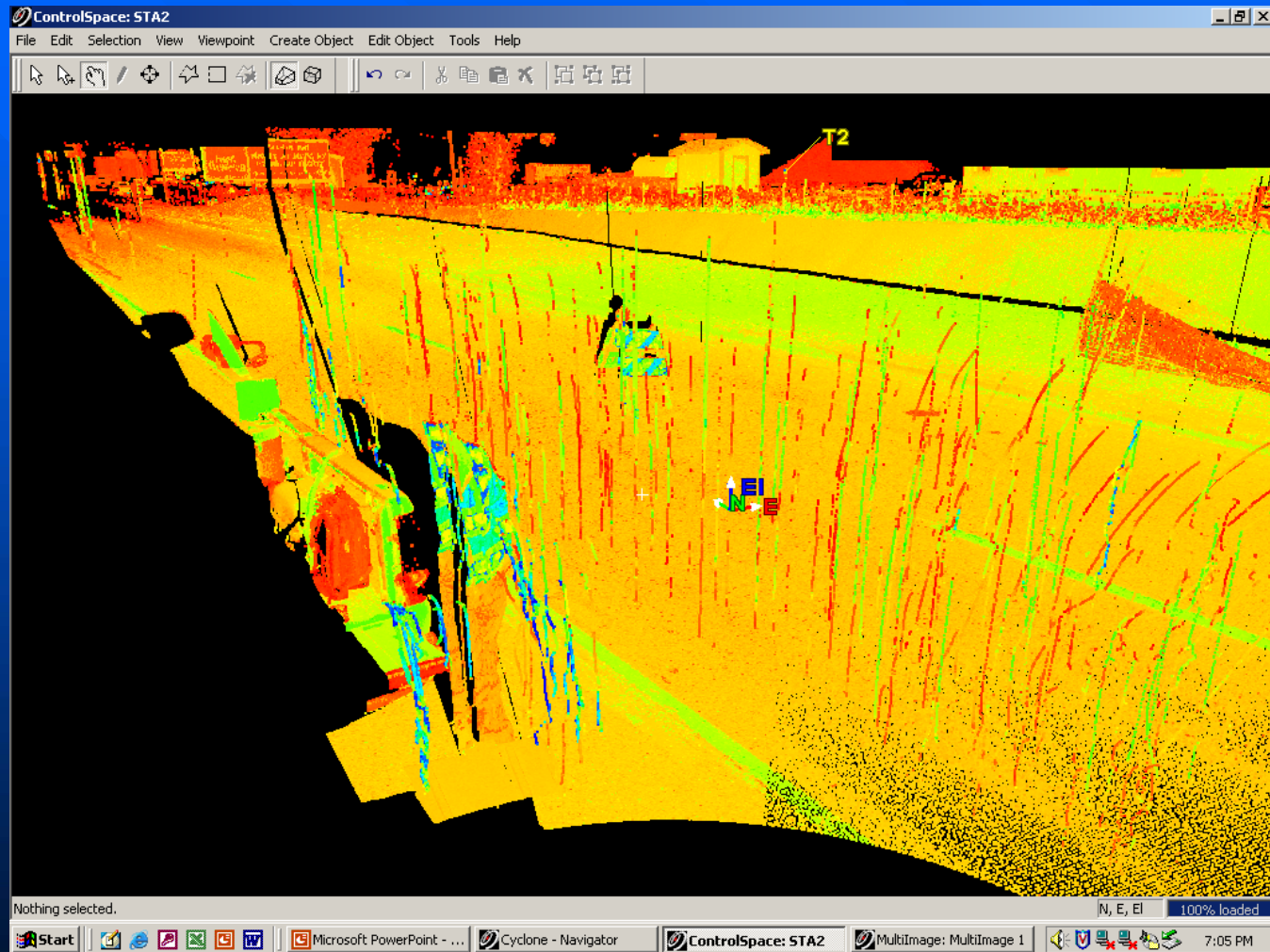
Point Clouds: Facing Southeast



Digital Photo Taken By Scanner

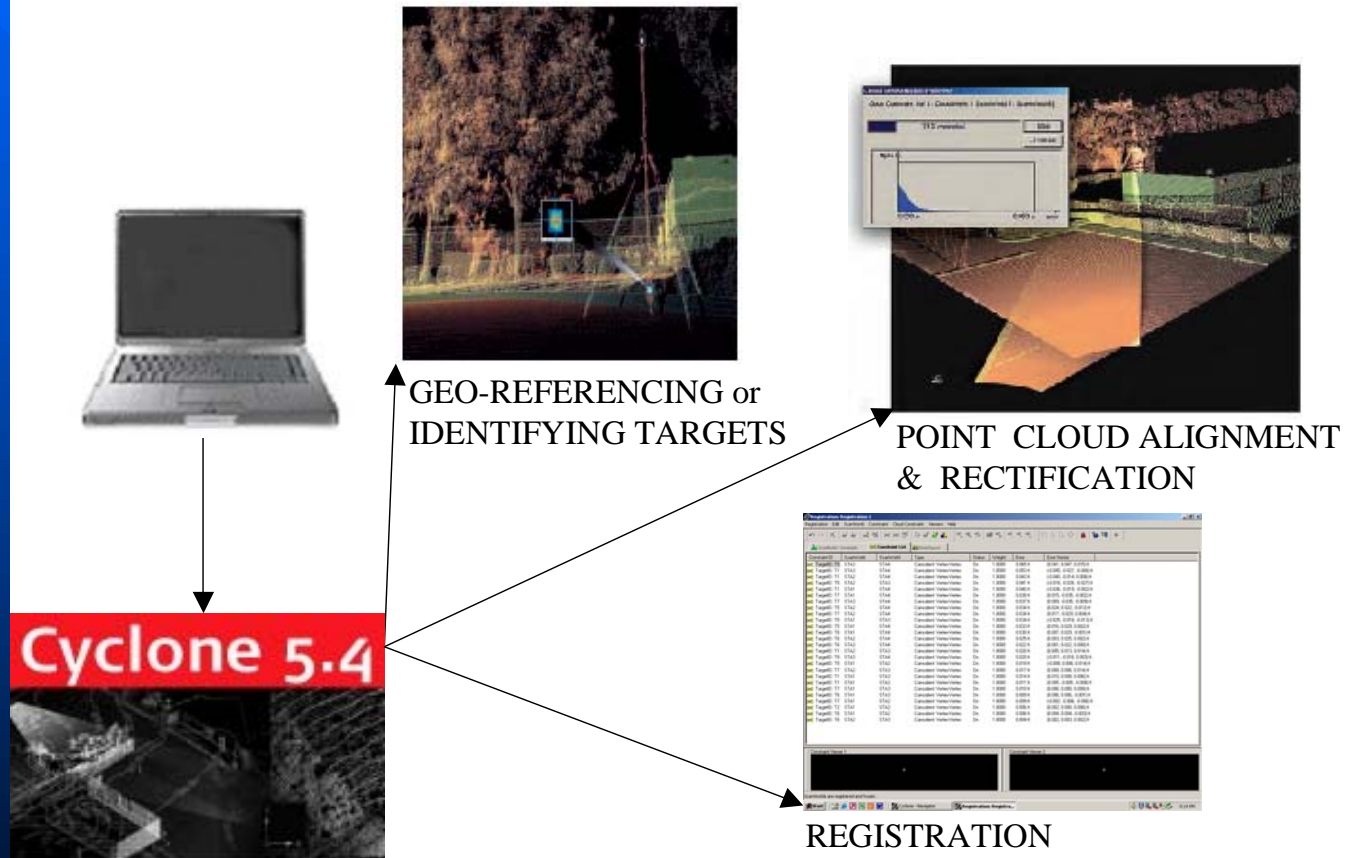


Point Clouds: Facing Northwest

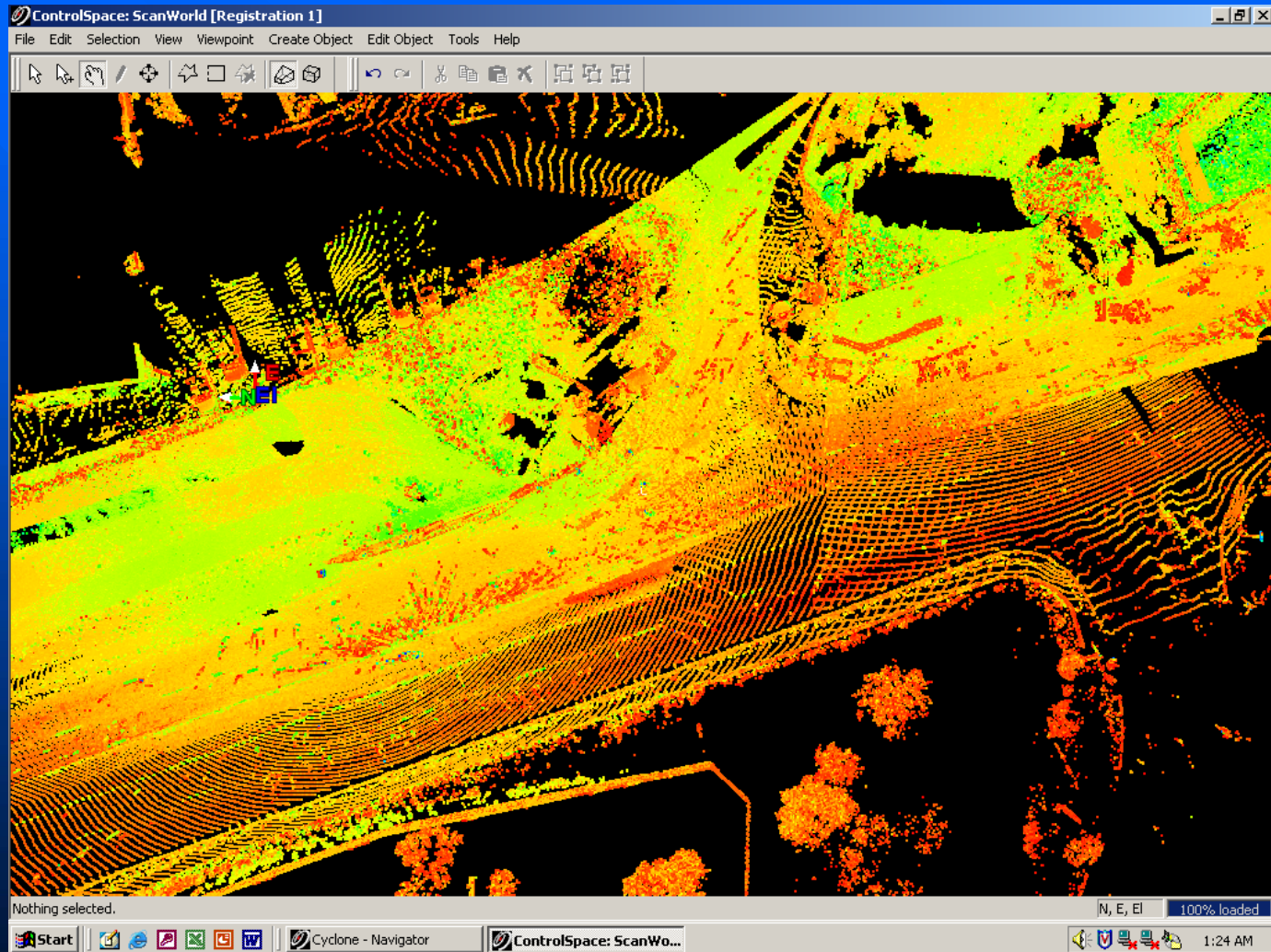


Combine Individual Scans

How does it work?



All Scans Combined



Target Registration

Registration: Registration 1

Registration Edit ScanWorld Constraint Cloud Constraint Viewers Help

ScanWorlds' Constraints Constraint List ModelSpaces

Constraint ID	ScanWorld	ScanWorld	Type	Status	Weight	Error	Error Vector
TargetID: T5	STA3	STA4	Coincident: Vertex-Vertex	On	1.0000	0.065 ft	(0.041, 0.047, 0.015) ft
TargetID: T1	STA3	STA4	Coincident: Vertex-Vertex	On	1.0000	0.053 ft	(-0.045, -0.027, -0.008) ft
TargetID: T1	STA2	STA4	Coincident: Vertex-Vertex	On	1.0000	0.043 ft	(-0.040, -0.014, 0.006) ft
TargetID: T5	STA2	STA3	Coincident: Vertex-Vertex	On	1.0000	0.041 ft	(-0.018, -0.026, -0.027) ft
TargetID: T1	STA1	STA4	Coincident: Vertex-Vertex	On	1.0000	0.040 ft	(-0.036, -0.019, -0.002) ft
TargetID: T7	STA1	STA4	Coincident: Vertex-Vertex	On	1.0000	0.038 ft	(0.015, -0.035, -0.002) ft
TargetID: T7	STA3	STA4	Coincident: Vertex-Vertex	On	1.0000	0.037 ft	(0.009, -0.035, -0.009) ft
TargetID: T5	STA2	STA4	Coincident: Vertex-Vertex	On	1.0000	0.034 ft	(0.024, 0.022, -0.012) ft
TargetID: T7	STA2	STA4	Coincident: Vertex-Vertex	On	1.0000	0.034 ft	(0.017, -0.029, 0.004) ft
TargetID: T5	STA1	STA3	Coincident: Vertex-Vertex	On	1.0000	0.034 ft	(-0.025, -0.018, -0.013) ft
TargetID: T5	STA1	STA4	Coincident: Vertex-Vertex	On	1.0000	0.033 ft	(0.016, 0.029, 0.002) ft
TargetID: T6	STA1	STA4	Coincident: Vertex-Vertex	On	1.0000	0.030 ft	(0.007, 0.029, -0.001) ft
TargetID: T6	STA2	STA4	Coincident: Vertex-Vertex	On	1.0000	0.025 ft	(0.003, 0.025, 0.002) ft
TargetID: T6	STA3	STA4	Coincident: Vertex-Vertex	On	1.0000	0.022 ft	(0.001, 0.022, 0.000) ft
TargetID: T1	STA2	STA3	Coincident: Vertex-Vertex	On	1.0000	0.020 ft	(0.005, 0.013, 0.014) ft
TargetID: T8	STA3	STA4	Coincident: Vertex-Vertex	On	1.0000	0.020 ft	(-0.011, -0.016, 0.003) ft
TargetID: T5	STA1	STA2	Coincident: Vertex-Vertex	On	1.0000	0.018 ft	(-0.008, 0.008, 0.014) ft
TargetID: T7	STA2	STA3	Coincident: Vertex-Vertex	On	1.0000	0.017 ft	(0.008, 0.006, 0.014) ft
TargetID: T1	STA1	STA3	Coincident: Vertex-Vertex	On	1.0000	0.014 ft	(0.010, 0.008, 0.006) ft
TargetID: T1	STA1	STA2	Coincident: Vertex-Vertex	On	1.0000	0.011 ft	(0.005, -0.005, -0.008) ft
TargetID: T7	STA1	STA3	Coincident: Vertex-Vertex	On	1.0000	0.010 ft	(0.006, 0.000, 0.008) ft
TargetID: T6	STA1	STA3	Coincident: Vertex-Vertex	On	1.0000	0.009 ft	(0.006, 0.006, -0.001) ft
TargetID: T7	STA1	STA2	Coincident: Vertex-Vertex	On	1.0000	0.009 ft	(-0.002, -0.006, -0.006) ft
TargetID: T2	STA1	STA2	Coincident: Vertex-Vertex	On	1.0000	0.006 ft	(0.002, 0.000, 0.006) ft
TargetID: T6	STA1	STA2	Coincident: Vertex-Vertex	On	1.0000	0.006 ft	(0.004, 0.004, -0.003) ft
TargetID: T6	STA2	STA3	Coincident: Vertex-Vertex	On	1.0000	0.004 ft	(0.002, 0.003, 0.002) ft

Constraint Viewer 1

Constraint Viewer 2

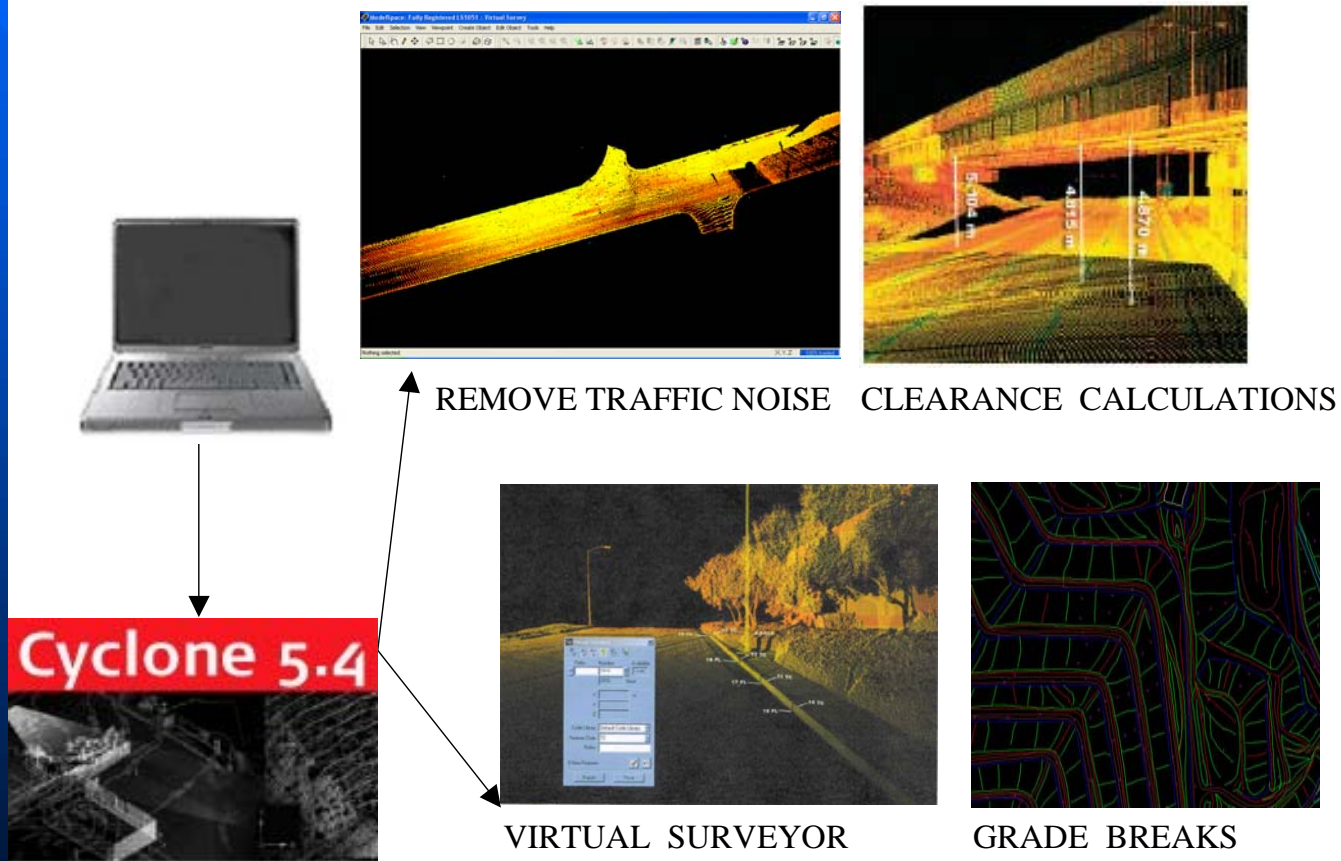
ScanWorlds are registered and frozen

Start Cyclone - Navigator Registration: Registra...

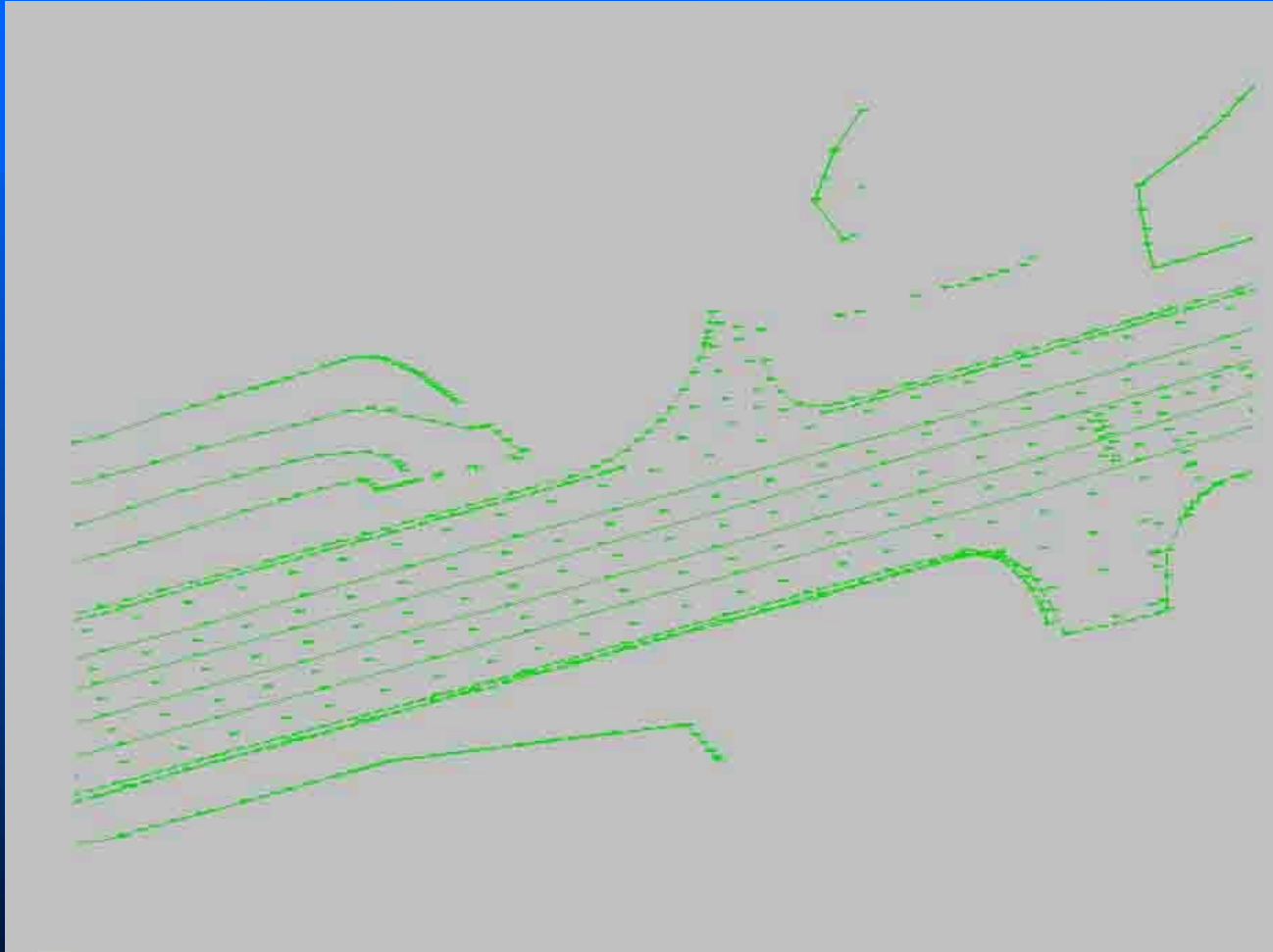
5:14 PM

Data Analysis & Extraction

How does it work?

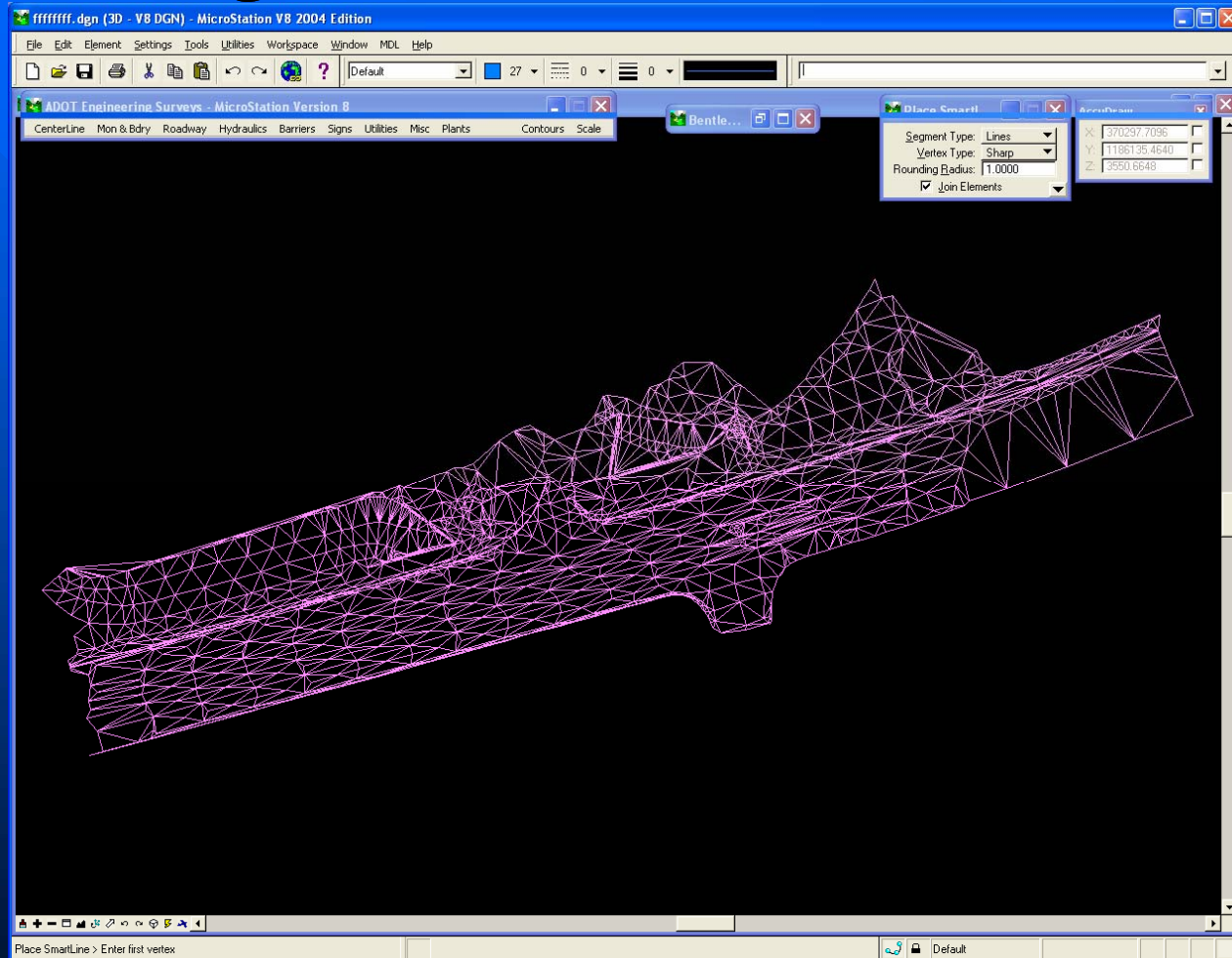


Extraction of Features from Point Clouds

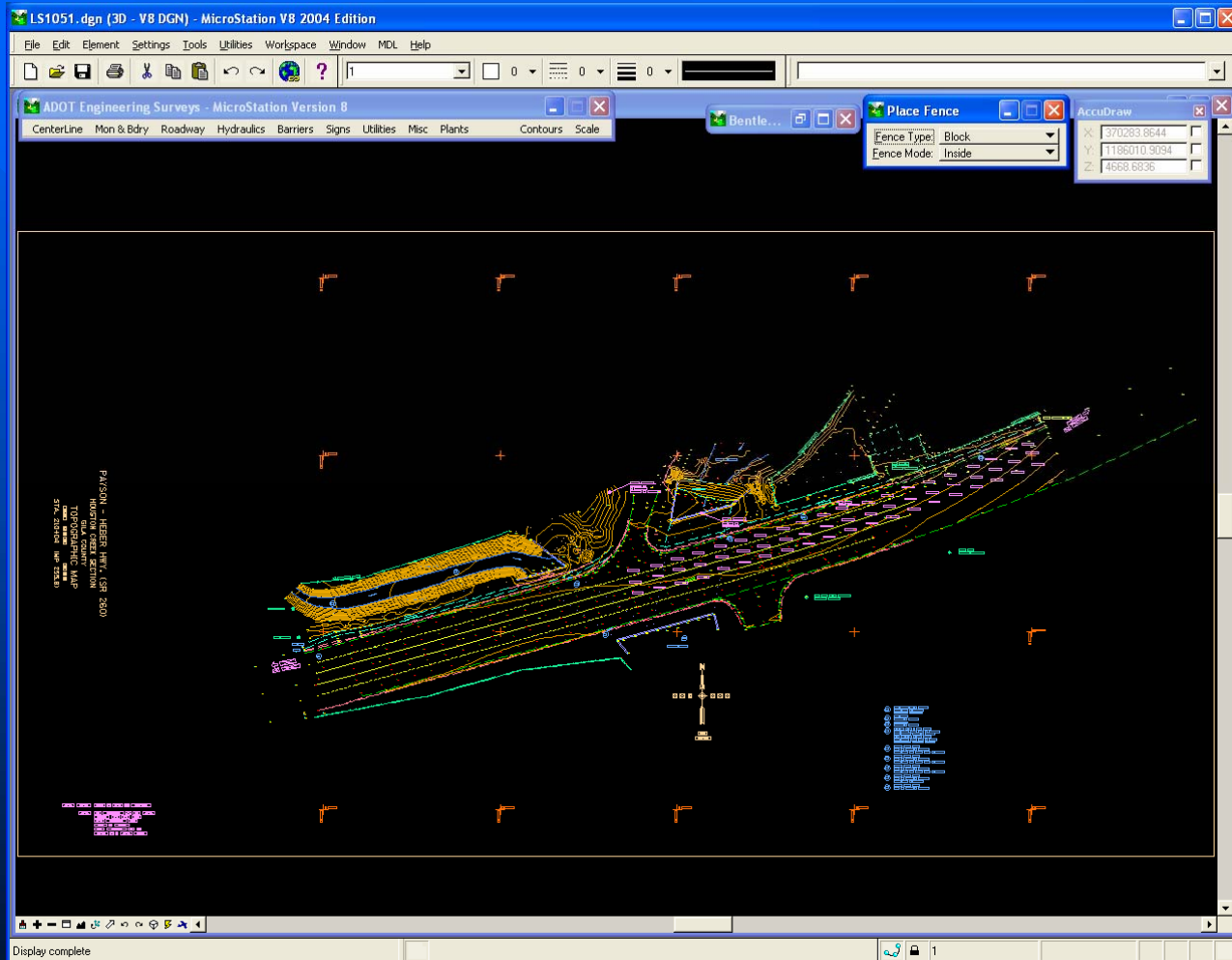


Deliver Finished Products

Digital Terrain Models



Deliver Finished Products MicroStation DGN Files



Deliver Finished Products Highway Alignments



Practical Applications of 3-D Laser Scanner

- High Traffic Volume Areas
- Crown Elevations on Busy Highways
- Scanning of Retaining Walls (Monitoring of Wall Movement)
- Scanning of Steep Terrain Areas
- Determination of Bridge Clearances
- Provides Safety for Field Personnel